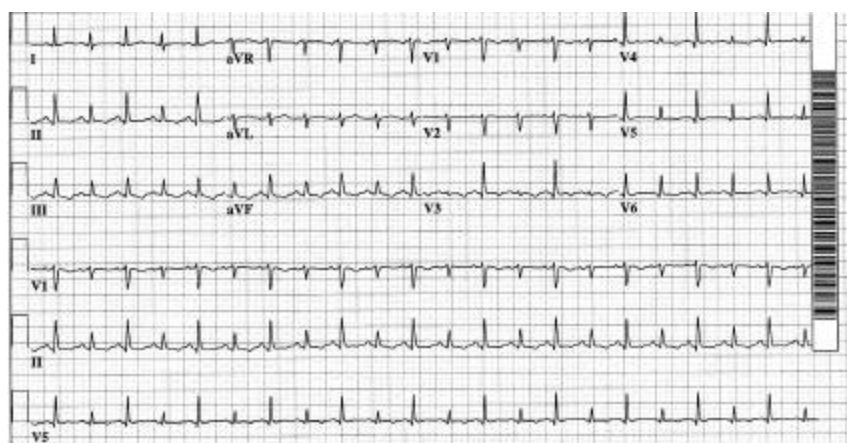


# Cardiac Tamponade and Electrical Alternans

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**A** 29-year-old woman with a medical history of metastatic melanoma presented with dyspnea and an increase in abdominal girth. She was tachycardic and had a pulsus paradoxus of 25 mmHg. Her 12-lead electrocardiogram revealed electrical alternans (Fig. 1). The echocardiographic study showed a beat-to-beat swinging motion of her heart in the large pericardial effusion (Figs. 2, 3, and 4). A pericardial window operation was performed, during which about 800 mL of bloody fluid was drained. The cytology of the pericardial fluid revealed malignant cells, and the patient died shortly after surgery. Autopsy showed melanoma that had metastasized to the wall of right atrium and the epicardial surface of the left ventricular apex.



**Fig. 1** Twelve-lead electrocardiogram shows electrical alternans. Note the alternating amplitude and vector of the P waves, QRS complexes, and T waves.

**Web site:** This article has also been published on the THI Web site at [texasheartinstitute.org/lau291.html](http://texasheartinstitute.org/lau291.html)

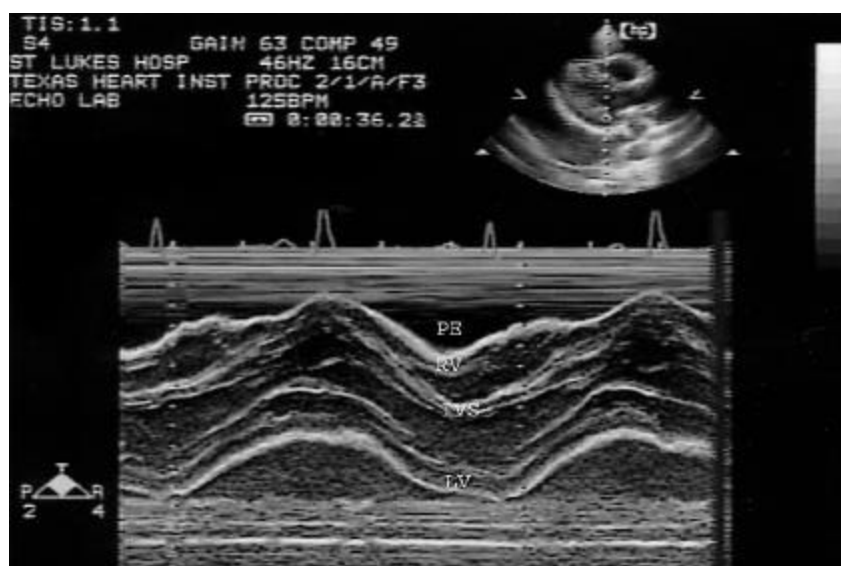
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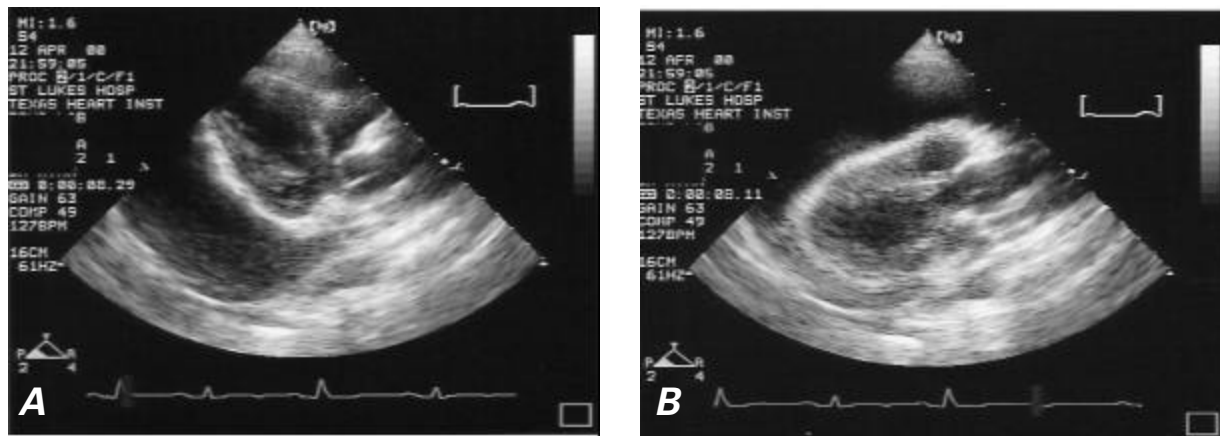
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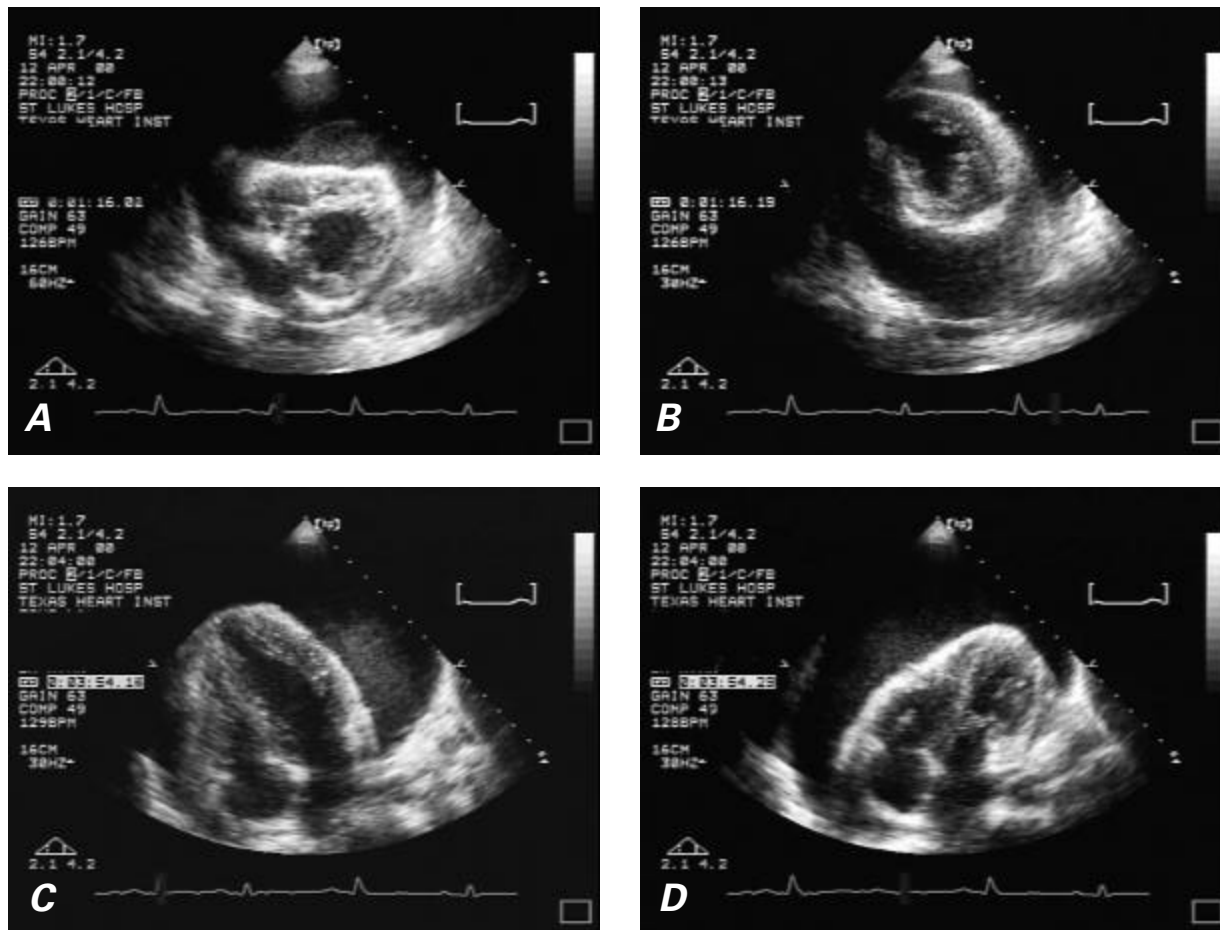
**Fig. 2** An M-mode echocardiographic image in the parasternal long-axis view shows the cardiac tamponade. Note the alternating cardiac position in the pericardial effusion.

IVS = interventricular septum; LV = left ventricle; PE = pericardial effusion; RV = right ventricle

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**Fig. 3** Parasternal long-axis echocardiographic images show the swinging heart. Note on the rhythm tracing that the amplitude of the R wave is **A**) greater when the heart is closer to the transducer and **B**) diminished when the heart is farther from the transducer.



**Fig. 4** Two-dimensional echocardiographic images show the cardiac tamponade: parasternal short-axis view (**A** and **B**) and apical 4-chamber view (**C** and **D**). Note the collapse of the right atrium and right ventricle during diastole, and the swinging, bouncing motion of the heart in the large pericardial effusion. The extreme beat-to-beat change in the orientation of the ventricle results from its pendulous movement within the pericardial sac and explains the alternating QRS vectors on the 12-lead electrocardiogram.

Real-time motion images are available at [texasheartinstitute.org/au291.html](http://texasheartinstitute.org/au291.html).